Weston Services, Inc.
Raritan Plaza I
4th Floor, Raritan Center
Edison, New Jersey 08837
(201) 225-3990

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Mr. Edgar G. Kaup, P.E.
Case Manager
Bureau of Federal Case Management
Division of Hazardous Waste Management
New Jersey Department of Environmental Protection
5th Floor, 401 East State Street
Trenton, New Jersey 08625-0029

Dear Ed:

On behalf of our client, L. E. Carpenter and Company, WESTON Services, Inc. (WSI) is submitting an addition to the Final Risk Assessment for the L. E. Carpenter site in Wharton, New Jersey, previously delivered to you on 30 May 1991.

The Section 5.4.2.5 was inadvertently left out of the final document during production. WSI has revised the sequence, not the content, of subsequent sections and the Table of Contents. The importance of this section warranted the supplemental submission.

Very truly yours,

WESTON SERVICES, INC.

David Henderson

DH/apc

Enclosure

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sediments at locations upgradient from production areas near the railroad right of way as well as points further downstream. The sediment sampling sites in question were considered to be background locations, as they are hydrologically upgradient from the site. It is not possible to precisely quantify the influence of the railroad right of way (and nearby parking areas) on these PAH levels; however, the possibility does exist that past activity in these areas could have contributed to PAH levels in sediments at this location. There is some uncertainty about the source of the PAHs found in sediments at these background locations as well as locations further downstream.

5.4.2.5 Regional Metal Concentrations Related to Previous Mining Operations

The Dover Magnetite District

The Dover Magnetite District is one of the oldest mining districts in the country and has been intermittently active since the early part of the 18th century. During that time, it yielded in excess of 26 million tons of iron ore. This is about 70 percent of the total production of iron ore from the State of New Jersey. Most of this activity took place prior to 1940. Subsequent to that time, production has been dominated by contributions from the Scrub Oaks, Richard, and Mount Hope Mines. The Mount Hope Mine, which was the last operating mine in the district, ceased operations in the mid 1980s. Ores found in the vicinity of Wharton, NJ make up what is known as the Wharton ore belt.

Mining Activities in the Vicinity of the L.E. Carpenter Property

The Washington Forge Mine: The Washington Force Mine was located directly on what is now the L.E. Carpenter property (Sims, 1958). The mine workings have long since been filled in. The mine was opened in 1868 by 2 shafts 20 ft apart, and was worked intermittently until 1875 when it was closed because of excess mine water. It was reopened in 1879 after the drainage tunnel to the orchard mine was completed, and was worked until 1881, when it was abandoned. At the time of its closing the mine had been developed through a length of about 250 feet and to an average depth of 200 feet. According to Bayley (1910, p. 394), the mine worked the Mount Pleasant deposit which, when active, was about 10 feet wide.

The West Mount Pleasant Mine: The West Mount Pleasant Mine was also located on what is now the L.E. Carpenter property, approximately 170 feet northeast of the Washington Forge Mine (Bayley, 1910, p. 394). The mine workings consisted principally of an inclined shaft, 300 feet deep, that was sunk to work the northeast continuation of the Mount Pleasant ore deposit found in the Washington Forge Mine. Sims (1958) examined the site in 1948 and found the shaft to

be completely inaccessible.

The Orchard Mine: The Orchard Mine was located on the west side of the Rockaway River, opposite the present location of the L.E. Carpenter site. The Orchard shaft, which was inaccessible in 1947 (Sims, 1958), was 200 feet south of Washington Force Pond. The mine is estimated to have yielded 375,000 tons of iron ore. The mine was opened about 1850 (Bayley, 1910, p. 392) and was worked nearly continuously until 1874, when an influx of water caused the operators to suspend operations. After the completion of a drainage tunnel from the adjacent underground workings of the Hurd Mine, the Orchard Mine was reopened in 1879, and it remained in operation until closing in 1884. The mine was reopened and worked from 1886 until 1893 and, later, from 1907 until 1910.

Composition of the Ore

The Mount Pleasant iron ore deposit consists predominantly of the metallic mineral magnetite. Magnetite is a magnetic iron oxide (FeO). Sulfide minerals, such as pyrite, chalcopyrite and pyrrhotit, are also reported ores from the Wharton ore belt (Sims, 1958). These minerals are important potential sources of arsenic, copper, lead, and zinc. Although abundant chemical analyses of the ore exist in the literature, all of the analyses of ores in the vicinity of the L.E. Carpenter property were made prior to 1908. Due to deficiencies in the analytical technology of the time, these analyses do not include minor constituents of the ore, such as lead, chromium, nickel, zinc, and arsenic which are of interest with respect to the environmental quality of the L.E. Carpenter site.

Ore Beneficiation

All the ore that was shipped from the district prior to 1893 was hand cobbed or hand picked, and that shipped between 1893 and 1916 was in part hand cobbed and in part concentrated on dry magnetic separators (Sims, 1958). In 1903, a magnetic concentrator was installed at the Orchard Mine, directly across the Rockaway River from the Washington Forge and West Mount Pleasant Mines (and the present location of the L.E. Carpenter property). Sims (1958) reports that the iron concentrates contained about 54% iron. Since this was a magnetic separation process, non-magnetic minerals (pyrite, chalcopyrite and pyrrhotite), containing relatively high concentrations of lead, chromium, nickel, zinc, and arsenic would have been enriched in the tailings.

Impact of Mining and Ore Beneficiation Activities on the Chemistry of the Sediments in the Rockaway River

On-site disposal of mine tailings was a common mining practice during the time of operation of

the Orchard, West Mount Pleasant, and Washington Forge Mines. Since the combined production of these three mines was in excess of 825,000 tons (Sims, 1958), these mining and beneficiation operations constitute the most significant local source of metallic contamination in the sediments of the Rockaway River and in the soils which make up the fill material at the L.E. Carpenter site.

5.4.2.6 Uncertainty with Potential Exposures

A major uncertainty exists with estimating potential exposures under various hypothetical site uses. Probably the most dubious hypothetical use is residential use with water supplied by onsite groundwater. The site has been used for mining, industrial and commercial purposes for over 100 years and residential use of the site would require rezoning. The area is served by public water supply system, making the installation of an onsite groundwater supply well not only ill-advised, but unnecessary; therefore, the exposures associated with residential use of the site, especially groundwater use, are not plausible. Potential exposures related to the other use scenarios are also uncertain; therefore, conservative assumptions were incorporated into the risk assessment.

5.4.3 Toxicity Assessment Uncertainty

Appropriate toxicity values were available, or could be derived for all of the chemicals of concern with the exceptions of slope factors for butyl benzyl phthalate and reference doses and slope factors for lead. In the absence of these factors, the potential carcinogenic effects of butyl benzyl phthalate and lead, and the potential noncarcinogenic effects of lead were not quantitatively evaluated. Butyl benzyl phthalate was identified as a contaminant of concern in shallow groundwater, soil, and stream sediments. Lead was identified as a contaminant of concern in deep groundwater and stream sediments.

It is likely that at the concentrations present, butyl benzyl phthalate would contribute only marginally to the overall carcinogenic risk due to exposure to sediments, groundwater, or soil, especially when the weak carcinogenic evidence (i.e., its Group C classification) is considered. A carcinogenic slope factor was not available and could not be derived for lead. Reference doses (previously available or derived) were not used based on Region II EPA guidance (EPA, 1989b). Carcinogenic and non-carcinogenic risks due to lead were not quantitatively evaluated. These risks were addressed qualitatively (Section 4.4) using current EPA guidance based on exposure levels considered protective of health in exposed children (the sensitive population).

A more general uncertainty relates to whether toxicity potentials of the substances calculated to

pose risk potentials above minimum levels of concern are representative of humans. Of the substances of interest in this risk assessment, only arsenic, benzene, and chromium have toxicity endpoints that were based on human exposure. Nickel is known to cause cancer in humans if inhaled but is not off concern by that route when the L.E. Carpenter site is considered.

The chromium risk above minimum levels of concern originated entirely on the assumption that 1/8 of the total chromium detected was present in the hexavalent form which is the form known to cause cancer in humans inhaling the material. It is not known whether any hexavalent chromium is present at the site (none is known to have been used by L.E. Carpenter).

The remaining substances are considered to be toxic to humans, as based on the most conservative outcome of studies with laboratory animals. Until evidence with humans is collected, there is no evidence that toxicity values used in this risk assessment approximate actual toxicity potential to any persons using the site at present or the future.

5.5 SENSITIVITY ANALYSIS

The only variable quantitatively evaluated in the sensitivity analysis for this risk assessment is the influence of the Clement "Comparative Potency" approach for PAHs on carcinogenic risk. For the polycyclic aromatic hydrocarbons (PAHs), two approaches were utilized to evaluate carcinogenic risk. Tables 5-21 to 5-28 compare the results of the standard EPA approach (EPA, 1989a) to the results of the ICF-Clement comparative potency (CP) approach (Clement, 1988). The CP approach (contracted by EPA) utilized a mathematical model that appears to be specifically applicable to what is theoretically known about the mechanisms associated with the carcinogenicity of PAHs. The model is then used on data derived from animal experiments. The results of this modeling were then used to produce a relative potency factor for each individual PAH. In general, these factors were anywhere from a tenth to a thousandth of the potency of benzo[a]pyrene. In fact, for some PAHs the data do not suggest any evidence for carcinogenicity. ICF-Clement evaluated the results of studies on PAH mixtures to compare the number of tumors predicted from the added potency factors to the actual experimental results. This exercise demonstrated that there were many more predicted tumors than actual tumors, suggesting that this type of analysis is still very conservative. As can be seen from the tables, the overall cancer risk for exposure to all organics and inorganics is lower using the CP approach numbers for the PAHs, but in general, the overall risk is changed by less than an order of magnitude. EPA is still evaluating whether to accept the CP approach for PAHs.

5.6 SUMMARY

A baseline risk assessment was conducted to determine the extent to which site-related contamination in various media on and in the vicinity of the L.E. Carpenter site may pose a human health and environmental risk to potential receptors under present and future land use conditions. The baseline assessment was conducted to determine the risk due to chronic exposure to carcinogens and noncarcinogens for several receptors under two separate scenarios.

- Present use scenario
  - A worker at the L.E. Carpenter site.
  - A trespasser on the L.E. Carpenter site.
  - A wader/swimmer in the Rockaway River, adjacent to the L.E. Carpenter site, and
  - A recreational fisherman on the Rockaway River adjacent to the L.E. Carpenter site.

- Future use scenario
  - A hypothetical adult resident on property formerly occupied by L.E. Carpenter site.
  - A hypothetical child resident on property formerly occupied by L.E. Carpenter site.
  - A wader/swimmer in the Rockaway River adjacent to the former L.E. Carpenter site, and
  - A recreational fisherman on the Rockaway River adjacent to the site.

A summary for all substances that at reasonable maximum concentrations exceeded minimum risk levels (i.e., one excess cancer case per million persons or a hazard index of one) either along or in combination with other substances is presented in Table 5-29. If the listing in Table 5-29 were modified to include only those substances exhibiting at least one excess case of cancer per one-hundred thousand persons or a hazard index of 10 using the upper 95% confidence limit concentrations, the substances remaining would be as follows: